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EDITORIAL

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Introduction: AI for and in Urban Planning

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Abstract

As a tool serving other disciplines of enquiry, artificial intelligence (AI) offers the potential of a potent discovery, a design and analysis paradigm to address (new) questions in urban planning. This thematic issue raises a forum for cross-disciplinary dialogues at the intersection of urban planning and AI. Nine articles discuss both emerging use cases in urban planning practice and the relevant AI techniques being used and developed, as well as articulate the challenges associated. Future development of AI in urban planning shall address the ethical, inclusive, and just implications of AI applications for urban planning while navigating human and AI agents' interactions and intra-actions to facilitate a better understanding of the intentions of AI development and use, and the impacts on the behaviour of designers and users in complex urban planning practices.

Keywords

artificial intelligence; development and evaluation needs; social-technical evaluations; urban planning practices

1. Introduction

Artificial intelligence (AI) offers the potential of a potent discovery, a design and analysis paradigm to address (new) questions in urban planning. This thematic issue raises a forum for cross-disciplinary discourse at the intersection of urban planning and AI. Specifically, this thematic issue looks at two aspects of this intersection: (a) AI *for* urban planning, where existing AI techniques are applied to questions of interest for urban planning scholars, and (b) AI *in* urban planning, where (urban planning and other) scholars raise new challenges for AI or develop new methods in AI. Contributions to the thematic issue by researchers and practitioners alike who identify with communities such as urban planning, built environment, environmental geography, AI communities, or situate themselves within a multi-disciplinary lens, were welcomed.

2. AI *for* Urban Planning

AI methods are increasingly being applied to understand evolving urban processes, simulate complex urban behaviour, and predict potential scenarios or events. This section delves into specific examples of how AI has been applied to urban planning, from improving social inclusivity in public spaces by predicting suitability of public events, simulating urban behaviours, predicting outcomes for various purposes, to enabling more sustainable practices in natural-based solutions and heritage planning practices.

Research by Hamdani et al. (2025) demonstrates how machine learning models can predict the suitability of public events by analysing urban features such as comfort and crowd density. This approach could enhance the design and activation of public spaces by designing more vibrant, adaptive public spaces that can change over time in response to user needs.

The use of agent-based models (ABMs) for simulating surveillance technologies and violent urban behaviours in urban digital twins (UDTs) settings is explored by Shtaierman et al.(2025). The study shows that ABMs could be applied in such settings for crowd management and civil violence suppression. This approach demonstrates the potential in using AI-driven simulations to inform crowd management and policy-making.

Solomou and Sengupta (2025) explore the use of a cognitive agent architecture to endow agents with memory representation and experiential learning to enhance their "intelligence" for dwelling location choices. The findings showcase the improved ability of cognitive-based intelligent agents to display dynamic market behaviours.

For nature-based solutions (NBS) in urban planning practice, Forster et al. (2025) employ machine learning models to create predictive models for assessing the suitability of areas for NBS, using different land use categories, zoning plans, and environmental features as inputs. Similarly, Delavar et al. (2025) explore the applications of AI in walkability assessment and highlight the evolution of methods used.

In the context of heritage planning, natural language processing is applied for a case study on wind-catchers by Foroughi et al. (2025). The study analyses unstructured textual data from multiple stakeholders. This research illustrates the possibility of incorporating AI into heritage planning to support the inclusion of diverse perspectives, helping to identify conflicts and alignments. This inclusive approach fosters understanding to balance development and preservation.

3. AI *in* Urban Planning: Development and Evaluation Needs

While AI has shown significant promise in urban planning, current applications often struggle with the complexity and unpredictability of urban environments, along with data inaccuracy and incompleteness. Several development and evaluation needs must be addressed to reach the meaningful potential of AI in urban planning. Urban systems are characterized by multiple interconnected sub-systems that respond to social, economic, and environmental influences. Successfully leveraging AI for urban planning requires developing technologies that are not only capable of handling data but also understanding the contextual nuances that impact human behaviour, urban interactions, and the social-technical implications associated.

From the data and user perspective, the diverse behaviours and preferences of citizens need to be represented and reflected by AI models, as mentioned by Delavar et al. (2025) and Foroughi et al. (2025) to enable meaningful discussions. Furthermore, Forster et al. (2025) emphasize the need for data that can represent the diverse ecological aspects of urban systems as well.

Within AI systems themselves, different components such as learning algorithms, data processing modules, and decision models can continuously interact, adapting to one another and evolving based on new data and changes in urban environments. This adaptability is crucial for understanding and predicting the complex, nonlinear behaviours present in urban systems. AI models must evolve to use real-time or simulated data to adapt to the real-world complexities of urban environments, ultimately leading to more effective and equitable planning outcomes, as discussed by Solomou and Sengupta (2025) and Shtaierman et al. (2025).

In urban planning practice, human agents themselves also influence each other's decisions, behaviours, and perceptions. For example, city planners, community members, and developers often interact through public consultations or collaborative decision-making processes. These interactions shape urban outcomes by fostering shared understanding, aligning goals, or even creating conflicts. When AI is integrated into these processes, it adds another layer of complexity, influencing collective behaviours. Designing AI tools that respect and enhance these human relationships, rather than undermining them, is essential, as explained by Foroughi et al. (2025) and Bingöl et al. (2025).

AI system design must also consider the interactions between human agents and technological-driven agents in urban settings. The dynamic interplay between human actions and machine responses can significantly shape the intention and behaviour of urban residents. For instance, ABMs used in UDTs by Shtaierman et al. (2025) illustrate how CCTV (both visible and invisible) could impact violent behaviour in public spaces with nudging behaviour in mind. These nudges can promote desired behaviours like safer crowd dispersal, while AI systems learn from these interactions to improve future recommendations.

Looking at all these interactions/intra-actions above, the evaluation of AI models in urban planning therefore involves assessing their effectiveness, inclusivity, and the broader impacts they have on urban environments. For example, Hamdani et al. (2025) evaluated the effectiveness of machine learning models in predicting public events, demonstrating how these models can improve public space utilization and social inclusiveness. However, the risk of relying solely on AI predictions is that they may overlook the unique cultural and social contexts of different communities, leading to unintended consequences. It is of great importance that the users are included in the design, implementation, and evaluation of the AI models in urban planning.

Similarly, Bingöl et al. (2025) highlight the potential positive impact of AI on energy-efficient renovations, but also the limitations regarding the lack of proper human-computer interaction designs that enable the evaluation of AI's impacts from users, examining whether the AI contributes to meeting sustainability goals without excluding marginalized groups. Delavar et al. (2025) also emphasized that there exists a notable gap in representing the experiences of diverse demographics and geographic contexts in walkability assessments using AI, such as the needs of disabled people.

Even though AI models together with UDTs have shown potential in urban safety management, the ethical implications of using such technology require careful evaluation to prevent misuse, as the power dynamics

might change in the designing and implementing phase of the technology. When AI systems are not designed with inclusivity in mind, biases can manifest in AI decision-making, leading to unequal treatment of different demographic groups, as has been suggested by Baker (2025). Baker's article draws attention to the significant biases and limitations of facial recognition technology (FRT) used in Detroit, USA, by noting that FRT has a high rate of misidentification for Black residents, which exacerbates racial inequalities. The use of AI in this context is framed as perpetuating existing inequalities rather than improving urban safety for all. It is crucial to implement transparent monitoring and validation mechanisms to assess AI performance and correct any biases that may emerge. This approach not only improves the fairness of AI models but also helps build public trust and involvement in AI-driven urban planning solutions.

Before making any decisions, it is important to ensure the multi-stakeholder deliberation process in the urban planning field for ensuring fair, participatory, and ethical practices with AI. Urban planning decisions directly impact the lives of residents, and it is essential to incorporate users' voices into the planning process. Furthermore, the different types of interactions and intra-actions need to be considered (within human agents, within AI systems, and the interaction between AI systems and humans) while designing, developing, and evaluating AI in urban planning. These tools should facilitate collaboration, helping to bridge the gap between various stakeholders or agents and ensuring that the resulting urban environments are equitable and inclusive. AI models, particularly those based on big data analysis and digital twin development, must follow ethical considerations, ensuring that they respect privacy and contribute positively to the well-being of the community. This is also supported by the research from Othengrafen et al. (2025) that the development of AI needs to include the collaborative aspects of urban planning, by integrating public participation and aligning with ethical and social values, particularly given the growing concerns about AI bias and privacy issues.

4. Conclusions

This thematic issue explores various aspects of AI for and in urban planning, ranging from its practical applications to the ethical considerations required for responsible deployment. AI is revolutionizing the field of urban planning, fundamentally altering how we sense and analyse the world as AI holds immense promise for addressing the complex and dynamic nature of urban environments. However, how the world could be managed and built with AI that is lasting and resilient to fulfil multiple users' requirements need to be further studied. Important questions to ask include: What do we intend to achieve with AI in urban planning? How do the interactions between human agents and AI-driven systems, as well as the relationships among human stakeholders, shape further the intentions and the behaviours that emerge? AI's role is not only about the tools we create but also about the ways we, as human agents, influence and are influenced by these systems (Harding, 2024; Murgia, 2024). By critically examining how AI influences both planners and residents and vice versa, we can begin to understand its range of possibilities and limitations. The goal is not just to create smart cities but also to ensure that these cities are equitable, resilient, and responsive to the diverse needs of their inhabitants.

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Conflict of Interests

The authors declare no conflict of interests.

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